

We Claim:

1 A fuel cell comprising:

- a. a single flexible or ridged bipolar separator plate;
- b. a flexible membrane electrode assembly;
- 5 c. a flexible bond, seal or gasket interposed between said single flexible or ridged separator plate and said flexible membrane electrode assembly, wherein said flexible bond, seal or gasket between said flexible or ridged separator plate and said flexible membrane electrode assembly comprises the fuel cell module, and wherein said flexible bond, seal or gasket may or not be an adhesive bond, seal or gasket which encapsulates edge portions of said flexible or ridged separator plate and said flexible membrane electrode assembly and wherein said flexible bond, seal or gasket seals the edge portions of said flexible membrane assembly to prevent the release of reactants from the fuel cell;
- 10 d. a manifold for the delivery and removal of reactants and reactant products to and from the fuel cell reactive areas where said manifolds may be either a single or multiple manifolds; and
- 15 e. a bond interposed between said manifold and said flexible or ridged separator plate, wherein said bond affixes said manifold to said flexible or ridged separator plate and wherein said bond provides a seal between said manifold and said flexible or ridged separator plate to prevent the release of reactants from the fuel cell.

2. A fuel cell comprising:

- a. a single flexible or ridged bipolar separator plate;
- b. a flexible membrane electrode assembly;
- c. a flexible seal, adhesive or gasket interposed between said single flexible or ridged separator plate and said flexible membrane electrode assembly, wherein said flexible seal, adhesive or gasket between said flexible or ridged separator plate and said flexible membrane electrode assembly comprises the fuel cell module, and wherein said flexible seal, adhesive or gasket is optionally an adhesive which encapsulates edge

5 portions of said flexible or ridged separator plate and said flexible membrane electrode assembly and wherein said flexible seal, adhesive or gasket seals the edge portions of said flexible membrane assembly to prevent the release of reactants from the fuel cell, and where the edge portion of the flexible or ridged separator plate is secured by rolling, bending over, crimping over the edge or combinations thereof of the said flexible membrane assembly and the said flexible seal and pressed or crimped against the said flexible membrane assembly and the said flexible seal to prevent the release of reactants from the fuel cell

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- 15 d. a manifold for the delivery and removal of reactants and reactant products to and from the fuel cell reactive areas where said manifolds may be either a single or multiple manifolds; and

20 e. bond interposed between said manifold and said flexible or ridged separator plate, wherein said bond affixes said manifold to said flexible or ridged separator plate and wherein said bond provides a seal between said manifold and said flexible or ridged separator plate to prevent the release of reactants from the fuel cell.

25 3. The fuel cell of claims 1 or 2 wherein said fuel cell is assembled as a single cell module which is assembled with additional single cell modules to create a fuel cell stack or unit.

30 4. The fuel cell of claims 1 or 2 wherein said fuel cell module in claim 3 comprises said single flexible or ridged bipolar separator plate, said membrane electrode assembly, said flexible adhesive bond, seal or gasket between said single flexible or ridged bipolar separator plate and said membrane electrode assembly, said manifold or manifolds, said adhesive bond or bonds interposed between said manifold or manifolds and said flexible or ridged bipolar separator plate.

5. The fuel cell of claims 1 or 2 wherein said separator plate comprises a metal material, a composite material, a polymeric plastic material, or combinations thereof.

6. The fuel cell of claims 1 or 2 above wherein the separator plate has
35 a thickness between about 0.0001 inch and about 0.500 inch and area of

between 0.1 inches square and 5000 inches square.

7. The fuel cell of claims 1 or 2 wherein the separator plate is of a square configuration, a rectangular configuration or other polygonal configuration, a circular configuration or any other rounded configuration.

5 8. The fuel cell of claims 1 or 2 above wherein said adhesive, seal or gasket is applied to said separator plate or said adhesive, seal or gasket is applied to said membrane electrode assembly and said separator plate and said membrane electrode assembly are bonded and or sealed together as a single unit.

10 9. The fuel cell of claims 1 or 2 wherein said adhesive bond of support 1c or 2c is a gasket.

10. The fuel cell of claims 1 or 2 wherein the gasket comprises a plastic polymeric material, or an elastomeric material, a composite material, a metallic material, a foam material, or combinations thereof.

15 11. The fuel cell of claims 1 or 2 wherein said adhesive bond, seal or gasket of forms part of the reactant flow field.

12. The fuel cell of claims 1 or 2 wherein said manifolds are external to the BSP and the MEA as to not cause disruption or through holing of the MEA either internal or external to the electrochemically active area.

20 13. The fuel cell of claims 1 or 2 wherein said manifolds are bonded to said BSP.

14. The fuel cell of claims 1 or 2 wherein said manifolds comprises of a plastic material, or a composite material, or a metallic material.

25 15. The fuel cell of claims 1 or 2 wherein said manifold is a single manifold.

16. The fuel cell of claims 1 or 2 wherein said manifolds are multiple in nature up to 26 manifolds.

20 17. The fuel cell of claims 1 or 2 wherein said manifolds have passages for a single reactant or multiple reactants and or a coolant or multiple coolants.

18. The fuel cell of claims 1 or 2 wherein the said bond between said manifold or manifolds and said membrane electrode assembly comprises a plastic material, a elastomeric material, a composite material, a metallic material, a foam material, or combinations thereof.

35 19. The fuel cell of claim 2 wherein the bent, crimped or rolled edge is

a separate part.

20. The fuel cell of claim 2 wherein the bent, crimped or rolled edge is continuous or discontinuous around the periphery the entire fuel cell.

21. The fuel cell of claims 1 and 2 wherein the bond, adhesive, seal or 5 gasket material is applied manually, robotically, by printing, stenciling, silk screening, or other known methods of application.

22. The fuel cell of Claim 8 wherein the gasket comprises a plastic polymeric material, an elastomeric material, a composite material, a metal, a foam or combinations thereof.

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